HEADQUARTERS
AIR FORCE CAMBRIDGE RESEARCH CENTER
AIR RESEARCH and DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Laurence G. Hanscom Field Bedford, Massachusetts

IN REPLY, ADDRESS:
COMMANDER
ATTN: CRZP P-6666

7 - NOV 1958

SUBJECT: Aircraft Artificial Contrail Generator

TO: Commander
Air Research and Development Command
ATTN: RDRGA, Major Brennan
Andrews Air Force Base
Washington 25, D. C.

1. Reference is made to letter dated 14 October 1958 from USAF to ARDC, subject: "Aircraft Artificial Contrail Generator" and 1st Ind. dated 23 October 1958 from ARDC to AFCRC.

2. This Directorate has made a preliminary survey of the feasibility of an airborne trail generator and reached conclusions as follows:

a. Missile tracking data indicate that a titanium tetrachloride generator would probably be satisfactory as an interim generator to produce visible trails from aircraft. Under optimum conditions, one and one-half pounds of titanium tetrachloride will produce a 160,000 foot long trail at an altitude of 200,000 feet which is visible from the ground. For aircraft operation at lower altitudes, the weight of material used could probably be reduced somewhat.

b. The chief factor contributing to the size of the generator would be the volume of the titanium tetrachloride tank. A tank that would carry ten pounds of material would have a volume of about three quarts, or 0.1 cubic foot.

c. It is planned to mount subject device internally, utilizing the heat of the exhaust to aid in dispensing the titanium tetrachloride. The combustion of the fuel produces the water necessary to hydrolyze the titanium tetrachloride and form titanium dioxide smoke.

d. The aerodynamic penalty would be kept to a minimum because of the small amount of material required and the internal mounting.

e. It is impossible ~~at this time~~ to estimate production and modification costs, but because of the anticipated simplicity of design, this should be kept to a minimum. The overall development cost

for designing and testing an interim trail generator, and research, development, and testing of a final optimized trail generator is estimated to be approximately $650,000, provided the necessary manpower and aircraft support are made available. A two-year program is envisioned.

f. An interim airborne generator can probably be tested within six months of the time that the necessary resources become available. ~~Initial testing would be in presently available AFCRC KC135 and F86L.~~

g. It is anticipated that considerable standardization can be achieved in bomber type aircraft. In fighter type aircraft, where space is at a premium, the storage tanks will have to be tailored to the available space.

h. It is felt that non-persistent contrails can be generated.

3. ~~It is felt that because of the urgency of this requirement,~~ the initial development should be that of the titanium tetrachloride generator. At the same time, parallel studies would be carried out on the development of other materials which would produce denser trails with less material; colored and fluorescent trails and other detection materials would also be investigated. New materials will be developed and tested using the equipment designed for testing the titanium tetrachloride, with a minimum of test equipment modification.

4. Further studies would be carried out on the problems involved in aircraft detection in order to best utilize the above aircraft warning techniques.

5. In order to minimize delay in beginning work on the project, a draft of an abbreviated DD Form 613 and ARDC Form 116 are inclosed for your use.

6. It should be understood that the schedule outlined in the plan assumes availability of required resources, including manpower, as stated. With the limited resources now available, the program would be prolonged for an indeterminate period.

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7. Finally, in view of the urgency for this work, it is strongly recommended that a 1A priority be assigned by USAF. This is required in order that materiel and test support be readily obtainable.

FOR THE COMMANDER:

Alan M. Gerlach

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1 Incl.
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